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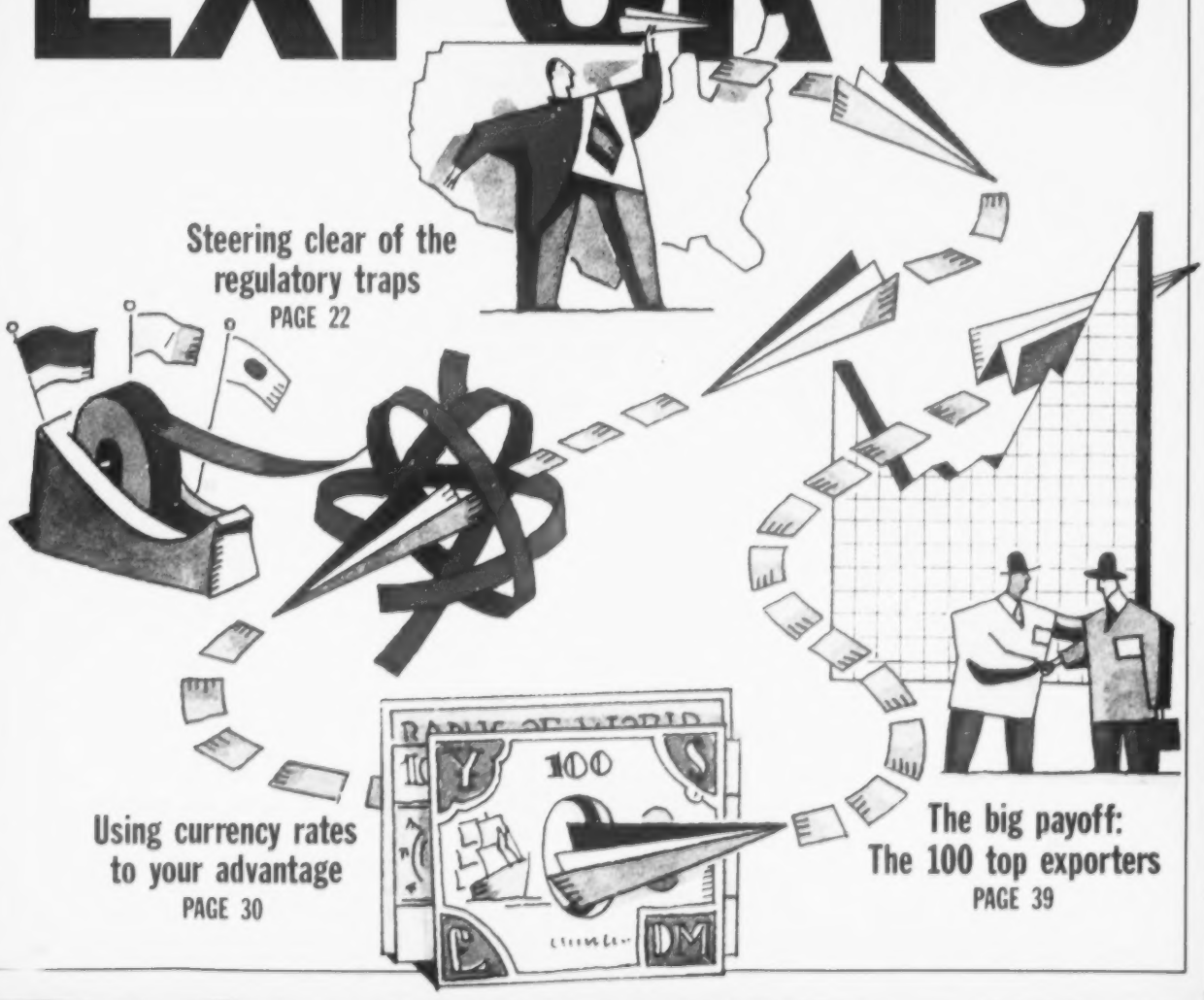
Electronic Business®

FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES–WORLDWIDE MARCH 16, 1992

THE PATH TO EXPORTS



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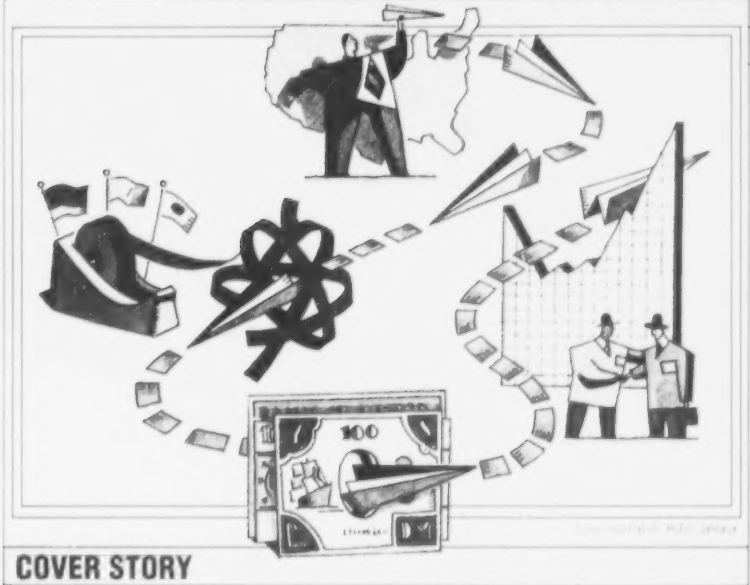
Electronic Business

VOLUME 18, NUMBER 5 — FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES—WORLDWIDE — MARCH 16, 1992



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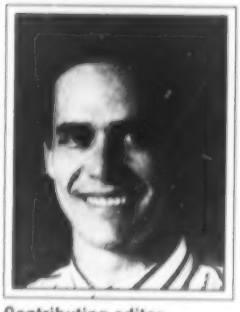
INSIDE BUSINESS

Trade-balance remedy begins at home

FOR SOME businesses, history presents a moving target: Either anticipate the trends or try to catch up with those who do. Our cover story makes the case that, while Washington could not have foreseen the recent events in the former Soviet Bloc, regulators now must find ways by which U.S. companies can take advantage of those events.



Contributing editor Dwight Davis

Contributing editor Dwight Davis reports some progress in easing export restrictions on electronics components and systems. Action by the 17-nation Coordinating Committee for Multilateral Export Controls has lifted thousands of names from the list of "core" products that were once considered strategically sensitive. Some officials, however, still appear to be waging the Cold War: Fiber-optics and other badly needed telecommunications technologies can't be exported to parts of the former Soviet Union, for example. And when premier U.S. supercomputer maker Cray Research recently lost out on major sales to Israel and India, it was due to strict export restrictions imposed by Washington and not because of limits set by the international community.

It's those roadblocks at home that electronics executives find particularly galling. A host of federal agencies still have a say in whether products comply with the provisions of several U.S. laws on strategic exports. But political and economic developments have changed drastically the way we view the former U.S.S.R., the chief target of those rules, and that creates a dilemma: In the new world disorder, how can one determine whether a particular trade deal will put strategic technology into the wrong hands?

Despite the economic slump, electronics exports from the U.S. are growing, as senior editor Linda Stallmann reports in this issue. Makers of electronic design-automation software and disk drives alone led the charge in exporting $53 billion worth of electronics during the first nine months of last year, about $2.4 billion less than America's total electronics imports for the same period.

Elsewhere in this issue, contributor Lisa Stapleton describes how U.S. electronics companies are being dragged into the unpredictable arena of world currency markets. Given the growing integration of the world's economies, she writes, even companies that deal entirely on U.S. soil must learn how subtle shifts in foreign currency can show up right on their bottom lines. □

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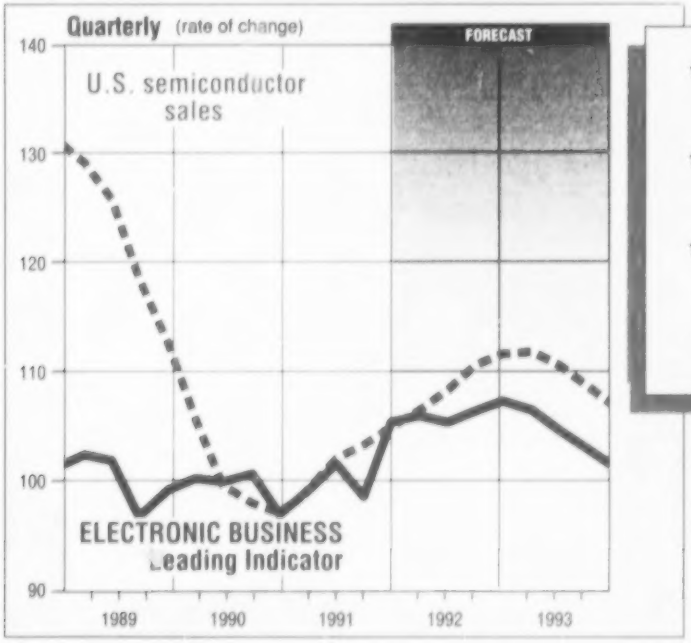
ELECTRONIC BUSINESS Leading Indicator

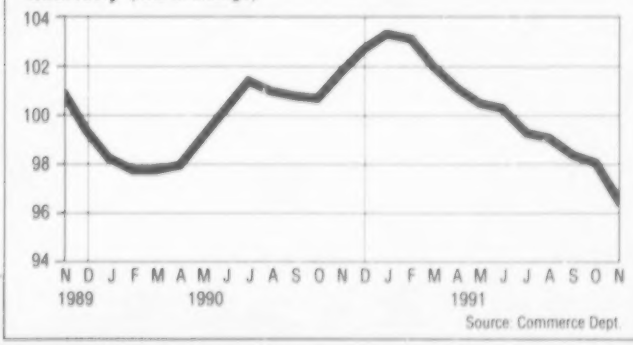


Indicator points to recovery in progress

IN THE FINAL MONTH of 1990, the ELECTRONIC BUSINESS Leading Indicator (EBLI) fell to a low point of 95.7, warning of a difficult year for the electronics industry in 1991. With hindsight, it is now clear that the Indicator was on target. Having climbed for the past four months in a row to 108.5 by December 1991, does it seem the Leading Indicator is now signaling a bonafide expansion in 1992? Yes, but don't expect anything near the record growth of 1988. The EBLI peaked at 120 after the 1986 slowdown, but the Indicator is not expected to break the 110 barrier in the next two years.

—John Farrell

Dwindling inventory restrained EBLI in 1991



Source: Commerce Dept.

	Latest month	Previous month	Year ago	1990 average
ELECTRONIC BUSINESS Leading Indicator (rate of change, Dec.)	108.5	105.6	95.7	99.9
U.S. semiconductor bookings ($ millions, 3-month average, Dec.)	$1,400	$1,337	$1,207	$1,254
Weekly hours of semiconductor production workers (monthly average, Nov.)	41.7	41.6	40.8	40.4
Electronic components lead time index (1977 = 100, Jan.)	83.6	91.9	73.9	80.7
S&P's semiconductor stock price index (1970 =10, monthly average, Dec.)	66.3	64.3	57.4	64.6
Change in electronic components inventories ($ millions, SA, Nov.)	-$199	-$53	$58	$33
Contracts and orders for plant and equipment ($ billions, SA, Nov.)	$37.9	$34.9	$36.5	$38.6

SA = seasonally adjusted; all other data are not seasonally adjusted

Sources: Semiconductor Industry Association, Bureau of Labor Statistics, *Electronics Purchasing* magazine, Standard & Poor's, Commerce Dept., Bureau of Economic Analysis, Cahners Economics

EBLI is a weighted composite of six statistics that lead activity in the electronics industry. To obtain a complimentary background paper, contact Michele Cooper, Cahners Economics, 275 Washington St., Newton, MA 02158-1630, USA; telephone (617) 630-2129, fax (617) 630-2100.

THE PATH TO EXPORTS

As Cold War-era export controls slowly abate, new U.S. policies burden electronics shippers

By Dwight B. Davis

Two months ago, Cray Research got word that Technion University in Haifa, Israel, had changed its plans. Rather than buying one machine from the Eagan, Minn.-based supercomputer maker, Technion had decided to buy two from Britain's Meiko Scientific Ltd.

The news by itself was bad enough. But what *really* hurt was that the sale had been torpedoed not by Meiko's superior technology, but by the U.S. government. "Technion was willing to open its doors to U.S. inspectors and had agreed to any restrictions that our government deemed necessary," says Lisa Kjaer, Cray's senior manager for international trade affairs. "But the government just kept delaying action on our license request." Technion officials apparently concluded that the sale wasn't going to be permitted, Kjaer says.

Cray isn't the only company to see its business shredded by the wheels of government. While U.S. export controls have eased somewhat with the collapse of the former Soviet Bloc, some exporters claim they're still mired in a maze of regulations that is designed largely to limit weapons proliferation and that undercuts their competitiveness. Others complain they must devise complex, costly, time-consuming procedures to ensure their companies' compliance with the law. "Exporting is more complex than ever," says David

Rose, manager of import/export affairs for Intel Corp.

Nor will it get easier soon. U.S. exporters today must cope with a swelling array of rules—including the Export Administration Act, the Arms Export Control Act, and the Nuclear Non-Proliferation Act—that are overseen by the Departments of Commerce, State, Defense, and Energy, as well as various intelligence agencies. "It's a bureaucratic morass," says Kevin Shannon, director of the Electronic Industries Association's International Business Council in Washington. The results, according to some exporters: legal liability for exports that end up in the wrong hands, hefty fines for those who break the rules, and big chunks of business lost to unreasonable paperwork delays.

Computers buoyed U.S. exporters in '91

($ billions)

Exports			Imports	
1990	1991	Industry sector	1990	1991
29.43	31.48	Computer/industrial	22.32	25.44
12.18	11.27	Solid state products	10.12	10.90
6.66	6.80	Communications	6.42	6.47
6.01	6.09	Passives*	7.65	7.83
2.00	2.21	Consumer electronics	11.95	11.84
.42	.55	Electron tubes	.43	.45

*includes electromechanical components
All data are for first 10 months

Source: U.S. Dept. of Commerce, Electronic Industries Assn.

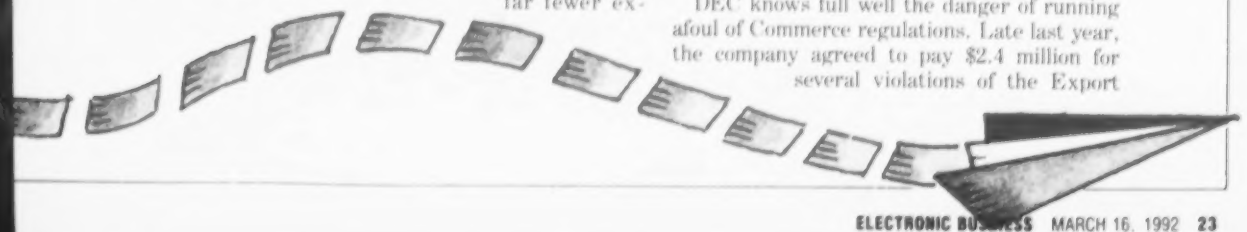
FOR DECADES, the U.S.'s export policy was set largely by the Coordinating Committee for Multilateral Export Controls (CoCom)—a 17-nation group that cooperatively sets restrictions on its members' strategic exports. CoCom publishes a "core list" of products that require licenses; the U.S. Department of Commerce, in turn, uses the core list to construct much of its own Commerce Control List. Prompted mostly by reduced East-West tensions, CoCom last year dramatically slashed its core list (see "Liberalized export rules get mixed reviews," p. 25).

Unlike the CoCom rules, however, the antiproliferation regimes apply unilaterally to U.S. exporters. They also apply to *all* products, including those that have been decontrolled by CoCom. More ominously, exporters must investigate the likely use of their products by foreign clients; if a customer uses a product for proscribed activities or diverts it to another user or country for such use, the U.S. seller may have to prove that it went to reasonable lengths to screen the customer first. So, while far fewer exports now need to be licensed, "the one that does requires that the exporter use his judgment about the intended use of the product," warns Jim Fitzgerald, president of Washington-based export consultants Fitzgerald & Associates.

The problem, according to many electronics exporters, is that customer-screening requirements are ambiguous, as are the penalties for infractions. Various laws provide for both civil and criminal penalties, but the Commerce Department's "death sentence" for an exporter is the denial of all export privileges, notes John Black, a senior consultant at MK Technology Deltac, an export consulting firm in Harisonburg, Va. "The government would never apply that penalty to a large legitimate exporter because it could drive it out of business," he says. Still, exporters go to great lengths to avoid penalties of any kind, along with the attendant bad publicity.

This increased responsibility, combined with the multiplicity of control regimes, puts additional pressure on exporters. "To determine if a product is decontrolled, we have to go through a decision-tree analysis that would run three to four pages if we printed it," says Lee Mercer, corporate export manager for Digital Equipment Corp. Although the number of products controlled and licenses required is down, he says, "the complexity of exporting and our cost of business is up."

DEC knows full well the danger of running afoul of Commerce regulations. Late last year, the company agreed to pay $2.4 million for several violations of the Export



What you can—and can't—sell abroad

Under new export rules, computers are rated according to their "composite theoretical performance." That, in turn, is determined by the computer's sophistication expressed in "millions of theoretical operations per second," or MTOPS. Most PCs and workstations are rated at 12.5 MTOPS or less.

MTOPS	Remarks	Example
Less than 6.0	The maximum level that can be shipped to Iran and Syria	DEC VAX 4000-300
6.0-12.5	Decontrolled for all countries except Iran, Syria, and embargoed nations *	DECstation 3100; Intel 486 33MHz chip
12.5-20	Computers can be exported at discretion of producer's home country. No CoCom-level approval required	Intel i960 40 MHz Intel 486 50 MHz
20-23	Favorable consideration for export to China, former USSR, and East Bloc countries. Subject to veto by any CoCom nation	DECstation 5000, model 133
20-41	Favorable consideration for sale to Poland, Hungary, and Czechoslovakia. Subject to veto by any CoCom nation	DECstation 5000, model 240
23 and above	"General exception" category for China, former USSR, and East Bloc countries. Shipments must be approved by all CoCom members	VAX 9000, model 210
41 and above	"General exception" for Poland, Hungary, Czechoslovakia	Intel i860 50 MHz
195-1950	First "supercomputer" category, subject to wide restrictions. License needed for all destinations except Japan	VAX 6000, model 560
1950 and above	Subject to intense restrictions; all shipments require licensing	Most computers from Cray Research

*Countries currently embargoed include North Korea, Vietnam, Cuba, Libya, Iraq, and Haiti.

Source: Digital Equipment, Sun Microsystems

Administration Act. Despite the size of the fine—the largest civil penalty ever imposed for export control violations—the infractions were relatively benign, a DEC spokesman claims. In 31 instances, he says, DEC shipped computer systems after applying for licenses, but before receiving them. The unlicensed shipments occurred between mid-1986 and early 1989, during which time the company applied for and received more than 3,000 export licenses. "In all but the last of the 31 cases, licenses were issued within days of the shipments," the spokesman says. In the last case, DEC withdrew the shipment before the license request could be acted upon. "The people who jumped the gun on the shipments are no longer with the company," he says, "and there was never any compromise or suggested compromise to the national security."

Compliance for a large computer company such as DEC, however, is far from simple. "We handle from 200,000 to 300,000 saleable options, all of which must be classified by country eligibility and level of technology," says Bob Rarog, DEC's export policy manager. Any given computer system may contain hundreds of hardware-software combinations, he notes. DEC codes each of the thousands of options and uses its system to compile a licensing profile of each system whenever an order is booked. In addition, the company uses an internal "denied parties" list to screen out buyers who have been blacklisted by the Departments of Commerce, Treasury, or State.

Like many large exporters, DEC does most of its export business via government-issued distribution licenses—bulk licenses that specify which products can be shipped to which countries with no further licensing requirements. About 90% of DEC's

Liberalized export rules get mixed reviews

LAST YEAR, the 17-nation Coordinating Committee for Multilateral Export Controls (CoCom) slashed its core list of export-restricted products; the new list, which makes up much of the Commerce Department's Control List, took effect in September. "The level of decontrol is more far-reaching than in the past," says David Rose, manager of import/export affairs for Intel Corp. "Not long ago, virtually every chip we exported needed a license."

The new list decontrols all dynamic random access memories (DRAMs) and microprocessors equivalent to a 40-megahertz 386 chip. The Commerce Department claims its current control list represents a 25% reduction in the number of microelectronics products requiring licenses.

Semiconductor equipment manufacturers also scored some gains under the new rules. Some products—sputtering machinery, inspection equipment, and silicon wafer-processing devices—are completely decontrolled, notes Victoria Hadfield, manager of government relations for Semiconductor Equipment Manufacturers International, an industry association. Controls on other products, such as lithographic equipment, have been reduced. In the past, for example, devices that could produce chips with 3- to 5-micron line widths were controlled; the new list lowers that to 1.5 microns.

The Commerce Department claims its current control list reduces the number of microelectronics products requiring licenses by 25%

Telecommunications shipments to the former U.S.S.R., however, are still unfairly restricted, according to Chris Padilla, manager of government relations for AT&T. Western suppliers can lay high-speed communications cables up to the region's borders, but they then must shift the traffic to low-speed lines. "It's like connecting a 10-lane superhighway to a country road," he says. Nor can telecom companies ship certain types of switching or transmission equipment, including single-mode fiber-optic cable, to the region. The reason, speculates Padilla, is that such equipment makes it harder for Western nations to tap the lines. As a result, he says, the former U.S.S.R. states can't buy equipment that is routinely sold to China or build a telephone system to match that of even a third-world country.

The effect of the new core list on computer producers is less clear. As part of the revision, CoCom introduced a new measurement of computer sophistication—composite theoretical performance, or CTP. Computers with a CTP ranking of 12.5 million theoretical operations per second (MTOPS) or less (which includes most PCs and workstations) are decontrolled for export to most countries (see "What you can—and can't—sell abroad," page TK).

For some, the revisions have had little effect. "We don't benefit from the 12.5 level of decontrol," says Hans Luemers, manager of export controls at Sun Microsystems Inc. "Products below that are obsolete for us."

At the upper end of the computing spectrum, the CTP scale defines supercomputers as machines rated at 195 MTOPS or more—a ridiculously low level, many exporters charge. "If the level is not raised significantly, it will catch commodity products such as servers and desktop computers," warns Luemers. Top-of-the-line supercomputers now perform in the 10,000 to 20,000 MTOPS range, says Lisa Kjaer, senior manager for international trade affairs for Cray Research Inc.

Indeed, the core list and other export-control regimes often fail to keep pace with technological advances. For now, about one-third of the CoCom core list is reviewed every two years. With computer performance levels doubling about every 18 months, that schedule "trails technology by miles," says Luemers. □

exports are shipped under distribution licenses, according to Rarog. To keep the distribution licenses in place, the company annually rescreens every foreign customer with an extensive questionnaire designed to flag potential product misuses or diversion. (Similar forms for prescreening foreign buyers are available to any exporter from the Commerce Department.)

DEC has about 120 export-control specialists. Smaller exporters that lack that expertise may find consultants useful. MK Technology Deltac, for instance, has its own distribution licenses that may be used to ship clients' products; that typically involves an annual retainer of $5,000 and up, says consultant Black. Other services include helping clients classify their products for export and shepherding export applications through the bureaucracy when licensing is required. The latter service varies by complexity; a license for exporting to China, for example, typically ranges between $350 and $500.

Despite some easing in export controls, "our cost of business is up," says DEC's Mercer

Another trouble spot for U.S. exporters is the gray area known as "administrative exception notes," or AENs. Certain computers and other products that fall into this category require no CoCom-level license but are subject to license at the country of origin's discretion. Some charge that U.S. exporters have suffered in the past because Washington has been more prone than its CoCom partners to restrict AEN-category products. "State Department officials admit that in the rest of the world, the AEN rating is tantamount to decontrol," says Howard Lewis III, vice president of international economic affairs at the National Association of Manufacturers (NAM).

In the past, AEN-category products were subject to review by any U.S. government agency that might object to their shipment. Under current export policy, the Department of Commerce can process and approve AEN license applications without any interagency review. Most license requests are processed within 72 hours, according to consultant Fitzgerald.

Some exporters disagree. "The President promised that by Jan. 1, 1991, AEN reviews would take no longer than 15 calendar days," says Chris Padilla, manager of government relations for AT&T. "We did a study in June 1991 and found that some of our applications were still taking from 45 to 60 *working* days to get approved."

AT&T and other large electronics companies take a proactive approach to speeding AEN reviews and other licensing delays simply by staying in close touch with the Commerce personnel who are assigned to the request. "The process is a back-and-forth dialogue," says DEC's Rarog. "We can't afford to just sit and wait."

Sitting and waiting, though, is exactly what some exporters do—and, they say, they lose business as a result. Cray's Kjaer claims to have lost "several outstanding orders," besides the Technion sale, to licensing delays. With a typical Cray supercomputer sale bringing in as much as $30 million, the effect of cancellations due to delays can be severe.

Nor is business lost only to what some call a glacial pace in Washington. On one occasion, Cray had been permitted to sell a midrange system to a weather center in India subject to "onerous" regulations: The Indian facility had to be guarded 24 hours a day, and the U.S. dictated which applications could be run on the machine. "So the Indian government started its own supercomputer program," Kjaer says. India's Center for Development of Advanced Computing has since produced its own supercomputer, the Param, and has sold at least two systems to the former Soviet Union. "U.S. export controls essentially created a foreign competitor" in a country that ships supercomputers to destinations forbidden by the U.S. government, says Kjaer.

To some observers, such government meddling, along with complex and outdated export controls, hurt the goal of increasing U.S. electronics exports. "It's crazy, since electronics is one area in which we're still competitive worldwide," says the NAM's Lewis. "We can't allow the export debate to remain so one-sided that everybody dives under the table whenever someone utters the words 'national security.'" □

Export boom winds down, but '92 won't be a bust

THE TOP EXPORTERS 100

Big winners in 1990 were Sun, Motorola, and Cadence. IBM was on top (again) with $6.2 billion

By Linda Stallmann

After a 19% surge in 1989, an 11.7% gain in 1990, and a more modest 6.5% increase during the first nine months of last year, U.S. electronics companies can expect another year of only modest export growth in 1992. "U.S. electronics exports this year will show about the same growth rate as 1991, but with more strength at the end of the year than at the beginning," notes James Haughey, a vice president for economics and research at Cahners Economics in Newton, Mass.

The forecast of modest growth for U.S. electronics exports, after domestic companies shipped almost $53 billion during the first nine months of 1991, can be traced to a combination of factors—less demand due to sluggish worldwide economies, an increase in interest rates, and the diminishing effect of the cheap dollar since the late '80s. "The dollar won't change much in the next few years," Haughey predicts.

Certain sectors—solid-state products and computer systems—continue to show export strength. Computer exports increased by more than $300 million during the first nine months of 1991, the largest dollar gain of any sector, according to the Electronic Industries Association. Essentially, the past is prologue; today's hot exporters will continue to be big sellers.

The ELECTRONIC BUSINESS survey of the 100 top exporters in 1990 shows the strength of the major players. It includes companies that represent more than half of the U.S. electronics industry's total exports of $71.6 billion. In fact, the top 10 companies shipped $22.3 billion worth of goods and services, or almost one-third of all electronics exports.

IBM led the list with exports of $6.2 billion, shipping 13.1% more goods overseas in 1990 than in 1989. Third-ranked Motorola Inc. in Schaumburg, Ill., made an impressive showing, improving its export sales by 20.8%, to $2.8 billion. Among the top 10, Mountain View, Calif.-based Sun Microsystems Inc.'s impressive 48.8% increase was the most dramatic.

Interestingly, the fastest-growing exporter was EDA software maker Cadence Design Systems Inc. of San Jose. It was ranked 46 after registering export revenue gains of 170%, to $158 million, due to a substantial expansion of its international sales and marketing efforts.

The losers in the export game include Control Data Corp. whose exports declined 72%, to $129 million, primarily due to the sale of Imprimis, its disk-drive subsidiary. Others that saw exports shrink include Sprague Technologies, down 43%, to $39.8 million; Micron Technology, down 36%, to $76 million; and Amdahl, down 27.7%, to $299.9 million.

Economists say that continued export growth will play an important role in the economic recovery, since it will outpace the growth of domestic sales this year. □

Electronic Business

1990 rank	Company	1990 exports ($ millions)	% change	1990 exports as % of U.S. sales	Rank	1990 exports as % of U.S. sales	Rank	1990 U.S. sales ($ millions)	1990 total sales ($ millions)
1	**IBM**	$6,195	13.1%	18.6%	76	17.5%	77	$33,327	$69,018
2	**Hewlett-Packard**	2,816	6.9	31.9	37	32.1	37	8,841	13,233
3	**Motorola**	2,801	20.8	32.0	36	28.5	47	8,759	10,885
4	**Digital Equipment**	2,082	-6.5	26.9	50	28.0	50	7,744	12,943
5	**GM Hughes**	1,895	23.8	16.2	85	13.5	89	11,723	11,723
6	**Unisys**	1,707	-10.5	25.9	53	27.1	52	6,578	10,111
7	**Raytheon**	1,435	7.1	16.5	82	16.3	82	8,699	9,268
8	**Intel**	1,202	20.5	36.2	28	36.0	26	3,318	3,921
9	**Sun Microsystems**	1,117	48.8	47.0	10	42.5	11	2,375	2,466
10	**Compaq**	1,019	27.9	38.1	25	33.7	33	2,677	3,599
11	**Xerox**	900	16.9	7.5	95	6.4	97	11,983	17,973
12	**Apple**	559	0.1	14.7	88	14.1	88	3,800	5,558
13	**Tandem Computers**	557	32.2	40.2	20	34.9	30	1,386	1,866
14	**Atari**	512	13.9	91.7	3	85.4	2	558	411
15	**Western Digital**	487	105.9	55.7	8	38.3	16	874	1,071
16	**Tektronix**	467	2.0	38.1	24	37.4	20	1,225	1,408
17	**NCR**	466	-3.5	16.3	83	16.5	80	2,859	6,285
18	**National Semiconductor**	421	3.6	31.5	39	30.9	40	1,336	1,675
19	**Varian Associates**	397	7.9	36.9	27	35.4	29	1,077	1,265
20	**Advanced Micro Devices**	348	-4.0	40.1	21	38.7	14	869	1,059
21	**Texas Instruments**	336	23.5	7.1	98	5.7	98	4,722	6,567
22	**Microsoft**	324	51.6	37.8	26	36.9	22	857	1,183
23	**Conner Peripherals**	304	-21.8	30.8	41	49.0	9	986	1,338
24	**Amdahl**	300	-27.7	19.1	73	25.4	56	1,571	2,159
25	**Tandon**	282	20.0	94.1	2	89.0	1	300	422
26	**AMP**	265	13.1	17.7	81	15.5	85	1,503	3,044
27	**Maxtor**	261	83.6	44.3	14	33.6	34	590	491
28	**Cray Research**	250	4.6	34.4	33	33.0	36	727	804
29	**Tandy**	241	7.3	5.7	99	5.5	99	4,202	4,500
30	**Storage Technology**	238	16.4	26.5	52	24.3	57	898	1,141
31	**Wang Laboratories**	225	-14.0	16.0	87	16.8	79	1,411	2,497
32	**Intergraph**	224	-5.4	28.9	45	34.2	32	776	1,045
33	**Data General**	214	-26.3	25.6	55	30.1	41	837	1,216
34	**LSI Logic**	211	37.1	26.7	51	23.6	60	791	655
35	**Honeywell**	209	-5.1	4.6	100	4.8	100	4,512	6,309
36	**Teradyne**	199	-8.5	43.3	16	44.9	10	459	459
37	**Novell**	197	34.4	39.6	22	34.8	31	498	498
38	**Applied Materials**	194	-7.8	42.9	17	54.6	7	451	567
39	**General Signal**	192	24.7	13.3	92	10.3	93	1,449	1,695
40	**Chips and Technologies**	185	49.0	63.0	5	57.0	6	293	293
41	**Loral**	181	31.6	14.2	90	11.6	92	1,274	1,274
42	**Harris**	172	-3.8	7.2	96	9.2	96	2,376	3,053
43	**Medtronic**	162	25.0	24.3	58	23.1	62	668	837
44	**Computer Associates**	160	-9.7	19.2	71	20.6	69	835	1,296
45	**Raychem**	159	8.2	28.1	48	26.8	53	567	1,115
46	**Cadence Design Systems**	158	170.0	57.0	6	38.0	17	277	231
47	**Quantum**	143	121.5	32.0	35	31.0	39	446	446
48	**3Com**	139	2.9	35.7	31	36.2	25	389	419
49	**Silicon Graphics**	134	49.8	36.0	29	35.9	27	371	420
50	**E-Systems**	130	-20.4	7.2	97	10.0	95	1,810	1,810

(Continued)

Electronic Business

1990 rank	Company	1990 exports ($ millions)	% change	1990 exports as % of U.S. sales	Rank	1990 exports as % of U.S. sales	Rank	1990 U.S. sales ($ millions)	1990 total sales ($ millions)
51	**Control Data**	$129	-72.0%	10.1%	94	18.9%	72	$1,278	$1,278
52	**Analog Devices**	127	16.9	35.8	30	32.0	38	355	485
53	**Gerber Scientific**	125	-1.4	40.8	19	42.5	12	307	307
54	**Perkin-Elmer**	124	8.1	24.0	62	23.3	61	518	838
55	**Scientific-Atlanta**	117	6.7	19.0	75	20.0	71	614	614
56	**VLSI Technology**	113	29.4	38.5	23	33.5	35	293	325
57	**Symbol Technologies**	108	8.8	56.0	7	53.0	8	193	232
58	**Oracle**	106	57.5	17.7	80	18.2	74	598	971
59	**Dell Computer**	104	64.3	22.5	64	17.4	78	463	546
60	**ESCO Electronics**	99	-10.0	18.3	79	18.3	73	538	538
61	**Westmark International**	93	31.5	21.8	66	18.2	75	425	485
62	**Diebold**	91	59.8	19.2	72	12.2	90	476	476
63	**Watkins-Johnson**	87	-1.8	29.1	44	29.5	44	299	312
64	**Archive**	81	60.0	27.7	49	28.0	51	293	293
65	**Convex Computer**	81	17.6	45.7	12	58.5	5	176	209
66	**AST Research**	79	-12.7	18.4	77	21.0	68	429	534
67	**Micron Technology**	76	-35.6	22.7	63	26.3	54	333	333
68	**International Rectifier**	74	45.8	43.4	15	35.9	28	170	230
69	**Andrew**	73	23.4	25.9	54	25.6	55	282	366
70	**MAI Systems**	72	2.4	45.0	13	29.5	43	161	389
71	**Stratus Computer**	69	7.5	24.0	60	21.8	67	288	404
72	**Burr-Brown**	68	-11.7	53.5	9	58.8	4	127	177
73	**Analogic**	66	22.1	46.3	11	37.5	19	144	144
74	**Cubic**	65	84.3	18.3	78	10.0	94	353	353
75	**Esterline**	64	21.4	20.1	69	23.6	59	317	389
76	**KLA Instruments**	62	24.4	100.0	1	36.6	23	62	168
77	**Pyramid Technology**	57	45.5	34.7	32	39.0	13	165	180
78	**Everex Systems**	57	6.6	14.6	89	15.9	84	388	437
79	**DSC Communications**	56	27.7	10.8	93	11.7	91	519	519
80	**GenRad**	55	-0.6	41.1	18	37.0	21	135	179
81	**M/A-Com**	55	30.7	16.2	84	16.4	81	341	375
82	**General DataComm**	55	2.4	29.5	43	29.7	42	186	202
83	**Silicon Valley Group**	55	11.4	31.6	38	38.6	15	173	184
84	**Dynatech**	52	2.9	14.1	91	14.9	87	369	433
85	**Concurrent Computer**	52	81.4	21.6	68	15.0	86	239	340
86	**Datapoint**	51	-25.5	68.4	4	60.6	3	75	267
87	**Integrated Device Technology**	50	20.9	24.0	61	23.0	63	209	209
88	**Cypress Semiconductor**	50	8.1	22.0	65	23.0	64	225	225
89	**Sequent Computer System**	49	17.8	24.2	59	36.4	24	204	249
90	**Vishay Intertechnology**	49	12.8	19.2	70	18.1	76	254	446
91	**QMS**	49	45.0	21.7	67	20.1	70	224	276
92	**Measurex**	47	-25.4	33.1	34	37.6	18	143	266
93	**Coherent**	46	0.5	30.8	40	28.7	46	148	191
94	**Kollmorgen**	44	7.0	24.4	57	22.2	66	180	239
95	**Intermec**	43	36.7	25.6	56	24.0	58	168	168
96	**Autodesk**	43	32.7	28.8	47	28.5	49	149	238
97	**Encore Computer**	42	31.6	29.9	42	22.7	65	141	215
98	**ADC Telecommunications**	42	33.1	16.0	86	15.9	83	260	260
99	**Aydin**	41	-11.4	28.8	46	29.4	45	142	142
100	**Sprague Technologies**	40	-43.1	19.0	74	28.5	48	209	315